June 1988

A New *Schizomus* from the Indian State of Maharashtra, with Additional Comments on Eyed Schizomids (Arachnida: Schizomidae)

James C. Cokendolpher
Lubbock, Texas

W. David Sissom
Elon College, Elon College, North Carolina

D. B. Bastawade
Maharashtra, India

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James C. Cokendolpher
2007 29th Street
Lubbock, Texas 79411 U.S.A.

W. David Sissom
Department of Biology
Elon College
Elon College, North Carolina 27244 U.S.A.

D. B. Bastawade
Zoological Survey of India
Western Regional Station
933/A, Shivajinager
Poona - 411 016, Maharashtra, India

Abstract

A new species of *Schizomus* is described from the Indian state of Maharashtra. It is the fourth described schizomid to possess convex ocelli. New information is given regarding some old records attributed to *S. cambridgei* (Thorell), species inquirenda. The female spermathecae of *S. bagnallii* (Jackson) and *S. biocellatus* Sissom are described and illustrated, and other characters of the two species are discussed.

Introduction

Schizomids are small arachnids that are usually characterized as being eyeless. Actually, there is variation from total eyelessness to the possession of pale eyespots and convex lenses. The lenses, when present, are only slightly raised above the prosomal surface and are unlike the eyes found in their relatives, the Uropygi and Amblypygi. It is unknown if these lenses enhance light reception in schizomids.

Three schizomid taxa have been described which possess these raised lenses: *Schizomus cambridgei* (Thorell), based on an immature specimen from Burma; *Schizomus bagnallii* (Jackson), a species imported to the Kew Botanical Gardens in England; and *Schizomus biocellatus* Sissom, recently described from Sumatra.

It is possible that other described schizomids also possess "eyes", but the subtlety of the character has caused them to be overlooked.

Recent surveys in the state of Maharashtra in southwestern India led to the discovery of a fourth schizomid with eyes. The description of this new species is the primary focus of this paper. Additionally, we provide new information on the previously described species, comment on some of their taxonomic characters, and discuss the relationships of the species to each other and to other schizomids.

Materials and Methods

Acronyms for collections referred to in this paper are as follows: AMNH, American Museum of Natural History, New York; BMNH, British Museum (Natural History), London; MCSNG, Museo Civico di Storia Naturale, Genova; NHMW, Naturhistorisches Museum, Wien; ZIZM, Zoologisches Institut und Zoologisches Museum, Hamburg; ZMB, Zoologisches Museum, Museum für Naturkunde der Humboldt-Universität zu Berlin; ZMUC, Zoological Museum, University of Copenhagen; ZSIC, Zoological Survey of India, Calcutta; ZSIP, Zoological Survey of India, Western Regional Station, Poona.

The methods and terminology essentially follow those of Reddell and Cokendolpher (1985), except that the female genital sternites were examined in lac-

tophenol (50 parts lactic acid, 25 parts phenol crystals, 25 parts distilled water). Lactophenol was used instead of clove oil because the use of it does not require dehydration and the visibility of spermathecal details is improved.

The term gonopod is used for the apophysis of the uterus externus (Börner 1904). The numbering of cheliceral setae follows the scheme established by Lawrence (1969: 125-130, Fig. 1A).

Schizomus tikaderi, n.sp. Figures 1-12

Schizomus sp.: Bastawade, 1985: 690-691.

Type data. Male holotype (ZSIC), 2 male paratypes (ZSIC, BMNH), 3 female paratypes (ZSIC, ZSIP, BMNH) from: Sinhagard Fort, about 1300 m. elev., 30 km. SW Poona, Maharashtra State, INDIA (June 1978, D.B. Bastawade). One female paratype (ZSIP, reg. no. I/323) from: Bhiv Ghat, about 760 m. elev., 40 km. S.W. of Atpadi on Atpadi-Kharsundi Road, Maharashtra State, INDIA (16 Sept. 1984, D.B. Bastawade).

Etymology. This species is named in honor of the Indian arachnologist, Dr. B.K. Tikader.

Diagnosis. Medium sized schizomids with distinct ocelli; three pairs of dorsal propeltidial setae; pedipalp trochanter rounded and not extended anteroventrally; male flagellum strongly convex with dorsolateral elevations; female flagellum three- segmented; spermathecae with 3-5 rounded lobes per side, with numerous spermathecal ductules.

Comparisons. The presence of ocelli places *S. tikaderi* with *S. bagnallii*, *S. biocellatus*, and *S. cambridgei*. Although the identity of *S. cambridgei* is uncertain, it can be separated from the other species in this group by its anteroventrally extended, sharply angled pedipalpal trochanter (Hansen and Sörensen, 1905: figs. 3a, 3b). The pedipalpal trochanters of *S. tikaderi*, *S.bagnallii*, and *S. biocellatus* are rounded and not extended anteroventrally (Figs. 1-3; Sissom, 1980: figs. 4-7).

Schizomus bagnallii possesses four pairs of dorsal propeltidial setae, whereas *S. biocellatus* and *S. tikaderi* possess only three pairs. The spermathecae of *S. biocellatus* are very distinctive (Figs. 13-14) and quite unlike those of *S. bagnallii* (Fig. 15) and *S. tikaderi* (Figs. 10-12).

Description. Male (length from distal edge of propeltidium to base of flagellum, 3.78-3.84 mm). Propeltidium and leg coxae orange brown; abdomen and remainder of legs darker brown to greenish brown.

Cephalothorax: Propeltidium 1.15-1.34 mm long, 0.65-0.66 mm wide; with one pair of setae, followed by single median seta apically and three pairs of dorsal setae. Apical margin of propeltidium drawn to a sharp, slightly down-turned point. Ocelli distinct, lenses clearly elevated above propeltidium surface. Mesopeltidia separated by less than the width of one plate. Metapeltidium undivided. Anterior sternum with two long, anteriorly directed setae arising from front of sternum, and 9 or 10 short setae; posterior sternum with 6 setae.

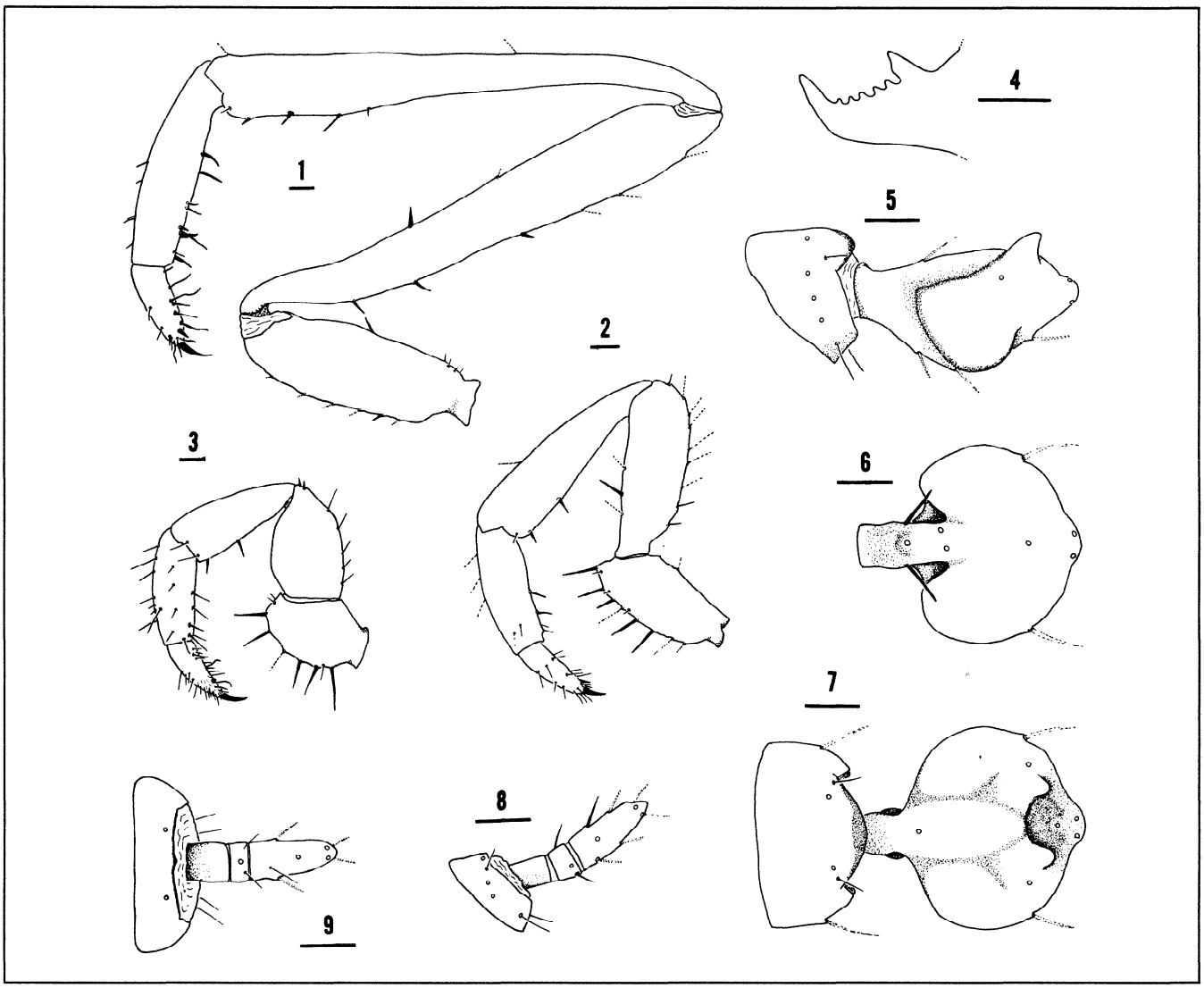
Abdomen: Sternite V about 3.5-4.4 times as wide as long. Tergite I with two pairs of very short setae anteriorly and one pair of dorsal setae on posterior margin. Tergite II with three pairs of short anterior setae bounded posterolaterally by a pair of round depressions; one pair of dorsal setae near posterior margin. Tergites III and IV each with one pair of dorsal setae; tergites V-VII each with one pair of dorsal and one pair of dorsolateral setae; tergite VIII with one dorsal pair, one dorsolateral pair, and one posterolateral pair of setae; IX with two dorsolateral pairs and one lateral pair of setae. Segments X- XII telescoped: X with one pair of lateral and seven ventral setae; XI with one pair of lateral and five or six ventral setae; XII with one dorsal pair, one dorsolateral pair, one lateral pair, and six to eight ventral setae, without dorsal process. Flagellum 0.41-0.42 mm long; shape and setation as in Figs. 5-7.

Pedipalps dimorphic: Either elongate and slender (Fig. 1) or short and stout (Fig. 2). Elongate pedipalps without spur on mesal margin of trochanter; claw about 1/3, spurs about 1/7 as long as dorsal length of basitarsus-tarsus (Fig. 1). Segment lengths (in mm, n = 2): trochanters 0.72, 0.80; femora 1.60,1.81; patellae 1.68, 1.87; tibiae 0.70, 0.74; basitarsi-tarsi 0.32, 0.34. Short pedipalps with trochanter slightly expanded ventrally and with small spur on mesal margin; claw about 1/3, spurs about 1/6 as long as dorsal length of basitarsus-tarsus (Fig. 2). Segment lengths (in mm, n = 1): trochanter 0.50, femur 0.63, patella 0.77, tibia 0.52, basitarsus-tarsus 0.49.

Legs: Femora IV 2.1-2.4 times longer than wide. For details on leg I, see below under comments.

Chelicerae: Fixed finger with five teeth (Fig. 4); serrula with 15 (plus guard) teeth; type I setae = 3; type II = 5; type III = 4; type IV = 4 setae, plus 5 longer dorsal setae; type V = 8; type VI = 1.

Female (length from distal edge of propeltidium to base of flagellum, 3.64-4.32 mm). Morphology and morphometrics as in male, except as follows: Tergites



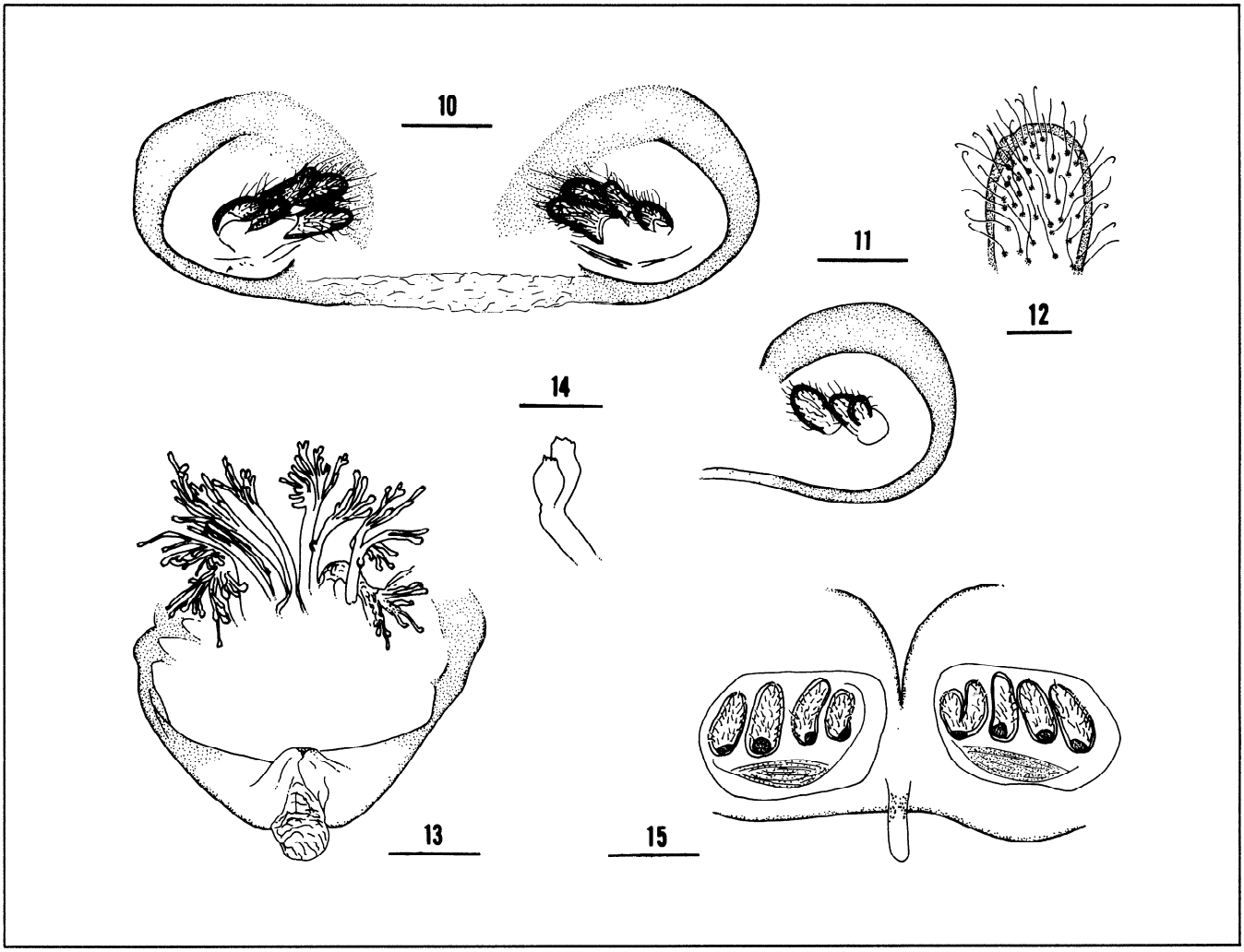
Figures 1-9. *Schizomus tikaderi*, n. sp.: 1) lateral aspect of male palpus (longform); 2) lateral aspect of male palpus (short form); 3) lateral aspect of female palpus; 4) lateral aspect of male fixed cheliceral finger; 5) lateral aspect of male flagellum; 6) ventral aspect of male flagellum; 7) dorsal aspect of male flagellum; 8) lateral aspect of female flagellum; 9) dorsal aspect of female flagellum. Scale lines = 0.1 mm.

IV-IX with numerous petite setae in addition to those found on males; X with eight ventral setae. Sternite V 2.1-2.9 times wider than long; femur IV 2.4-3.0 times longer than wide. Flagellum 0.24-0.29 mm long; consisting of three segments; morphology as in Figs. 8-9.

Spermathecae with 3-5 (mode = 3) medially directed, rounded lobes per side; each lobe covered by numerous ductules (Figs. 10-12); details of gonopod not observed.

Measurements (in mm, n = 2): Propeltidium length 1.08, 1.28; propeltidium width 0.54, 0.69. Pedipalps: trochanters 0.40, 0.46; femora 0.39, 0.52; patellae 0.46, 0.58; tibiae 0.36, 0.48; basitarsi-tarsi 0.21, 0.28; claw 0.08, 0.11. Leg I (from single intact female, represented by the smaller measurements above): coxa 0.46, trochanter 0.30, femur 1.02, patella 1.10, tibia 0.64, basitarsus-tarsus 0.78 (basitarsus and tarsal pseudosegment lengths as follows: 0.28, 0.04, 0.06, 0.06, 0.08, 0.08, 0.18).

Comments. All specimens except the small female are lacking the majority of their legs; however, the loose legs are all stored in a separate vial. Two relatively complete first legs were measured to provide information on variation. These legs could not be associated with any par-



Figures 10-15. *Schizomus* spermathecae: 10-12) *S. tikaderi*, n. sp.; 13-14) *S.biocellatus* Sissom; 15) *S. bagnallii* (Jackson); 12 and 14 detail of spermathecal lobes. Scale lines = 0.01 mm for fig. 12, 0.005 mm for 14, 0.05 mm for others.

ticular specimen (male or female). The measurements (in mm) are as follows (shorter leg given first): femora 1.10, 1.34; patellae 1.28, 1.46; tibiae 0.92, 0.94; basitarsi-tarsi 0.78, 0.91. The lengths of the basitarsus and tarsal pseudosegments on the two legs are 0.30, 0.04, 0.06, 0.06, 0.06, 0.08, 0.18 and 0.36, 0.06, 0.08, 0.07, 0.08, 0.08, 0.18, respectively.

Natural History. *Schizomus tikaderi* is thus far known from only two localities, Sinhagard Fort (1300 m) and Bhiv Ghat (760 m), both of which are characterized by hilly terrain. At Sinhagard Fort, specimens were taken from under stones on top of the fort; at Bhiv Ghat, they were taken from wet litter of the myrtle, *Sizygium cumini* (Linn.) (Bastawade, 1985). All collections were made during the rainy season.

Schizomus cambridgei (Thorell), species inquirenda

Tripeltis cambridgei Thorell, 1889: 526, 559-562, pl. V (figs. 1-3); Kraepelin, 1897: 53, 57; Rowland, 1973b: 196.

Schizonotus cambridgii: Pocock, 1893: 4 (lapsus calami).

Trithyreus cambridgei: Kraepelin, 1899: 234-235 (part); Hansen and Sörensen, 1905: 6, 53, 69-70, 78, pl. 7, (figs. 3a-d); Kästner, 1932: 3, 13, 16, 18, 30 (figs. 4, 6, 17, 21, 24, 26, 42); Werner, 1935: 337, 341, 343, 358-359, 366, 379, 384, 388, 404 (figs. 18, 22, 26, 53, 55, 68b, 74, 79b, 101-104); Sissom 1980: 187, 189-190; Reddell and Cokendolpher, 1985: 44.

Triplomus cambridgei: Cook, 1899: 250 (by implication).

Trithyreus cambridgii: Pocock, 1900: 121-122 (lapsus calami); Jackson 1908: 75-77 (lapsus calami); Jackson, 1909: 438 (lapsus calami).

Schizomus cambridgei: Mello-Leitão, 1931: 17, 67 (figs. 1-2, 7 (part).

Type data. Juvenile female holotype (lost, formerly MCSNG) from: Prome, Pegu Division, BURMA (pre-1889, L. Fea).

Distribution. Known only from the type locality.

Comments. The holotype of this species was mutilated (Hansen and Sörensen, 1905) and, according to G. Arbocco (pers. comm., 6 Aug. 1984) of MCSNG, is lost. The vial formerly housing the holotype is at MCSNG, but contains a label indicating that the specimen is missing. Dr. Arbocco reports the label as being quite old and of unknown authorship. Sissom (1980) previously considered *S. cambridgei* a "species inquirenda", and it remains so.

Topotypical material from Burma needs to be examined before the identification of this species is certain. The presence of ocelli, three-segmented female flagellum, and anteroventrally extended pedipalpal trochanter (with small mesal spine or spur) will aid in recognition of this species.

Specimens reported by Kraepelin (1899) as this species from "Bismarck-Archipel (Ralum)", were misidentified. They were a species new to science at that time, and are referable to *Schizomus modestus* (Hansen in Hansen and Sörensen, 1905). The specimens, collected by F. Dahl at Ralum (Gazelle Peninsula, Bismark Archipelago, NEW BRITAIN) on 21 Oct. 1896, were apparently divided between the ZMB and ZIZM. The two females (one lacking an abdomen) housed at the ZIZM are labeled "*Tripeltis cambridgei* Thor Dahl 21.X.96. 2.19.XI.97 Ralum Neu Vornomern" and are apparently the specimens examined by Kraepelin. (In 1899, Prof. Kraepelin was the Director of the Naturhistorischen Museums in Hamburg.) The material at the ZMB (Moritz and Fischer, 1980) was used to make the original description of *Trithyreus modestus* Hansen in Hansen and Sörensen, 1905.

Börner (1904:1) acknowledges both Prof. Kraepelin and Prof. Dahl (the latter was then at the Berliner Zoologischen Museums) for "3 1/2" specimens of *Trithyreus cambridgei*, on which he based his extensive anatomical studies (1902a-c, 1904). We have examined the specimens from the ZIZM and find that their morphology matches Börner's illustrations (including those of the diagnostic spermathecae).

Finally, Mello-Leitão (1931) also reported specimens of *Schizomus cambridgei* from "Ilhas de Bismark" and mentioned other specimens from "India" and "Burma". The record from the Bismark Archipelago obviously refers to the specimens in the ZMB and ZIZM, and the record for Burma to the type locality; the record for India requires confirmation.

Schizomus biocellatus Sissom
Figures 13, 14

Schizomus biocellatus Sissom, 1980: 187, 188-191, figs. 1, 3-4, 6-10; Reddell and Cokendolpher, 1985: 44.

Type data. Male holotype (NHMW, Inv.-no. 8261), 162 paratype males, 498 paratype females and juveniles (NMHW, Inv.- no. 8262); 2 paratype males, 1 paratype female, 1 paratype juvenile (BMNH); 2 paratype males, 1 paratype female, 1 paratype juvenile (AMNH) from Bukittinggi (= Fort de Kock), about 67 km. N. Padang, in Padang Highlands, SUMATRA, elev. 920 m. (1925, E. Jacobson).

Distribution. Known only from the type locality.

Comments. In the original description of this species (Sissom, 1980), a single subapical spur was reported on the basitarsus-tarsus of the pedipalp. There are two spurs, one located on each side of the segment near the base of the claw. The spermathecae and gonopod are re-illustrated (Figs. 13, 14), showing greater detail of the gonopod and spermathecal distal lobes. Although the number of terminal branches on the spermathecae vary considerably, there are four major branches per spermatheca. Ductules leading from the spermathecae were not detected even by the use of a phase-contrast microscope with an oil immersion objective (99X).

The multiple-branched spermathecae of this species are quite unlike any others reported for the order, but spermathecae of most named Old World species have yet to be illustrated. The continued study of spermathecal morphology in all schizomids will certainly prove useful in clarifying kinships in the order.

Schizomus bagnallii (Jackson)
Fig. 15

Trithyreus bagnallii Jackson, 1908: 50, 74-77; Jackson, 1909: 419, 438-439, pl. X (figs. 1-5).

Trithyreus bagnalli: Kishida, 1930: 18 (unjustified emendation).

Schizomus bagnallii: Mello-Leitão, 1931: 17; Sissom, 1980: 187-191 (figs. 2, 5).

Type data. Lectotype female, paralectotype female, and 2 paralectotype juveniles (BMNH) (all designated by Sissom, 1980) from: Royal Botanic Gardens, Kew, Surrey, ENGLAND (Dec. 1907 Gardens Survey, R.S. Bagnall). An additional female "cotype" collected at the Royal Botanic Gardens (Jan. 1908, H. Donisthorpe) was

not mentioned by Sissom (1980). The vial containing this specimen is labeled "H.J. Hansen (26/518) Cotype" and "*Trithyreus Bagnalli* Randell Jackson [female symbol] Kew Gardens London Co-type"; it is here regarded as a paralectotype. This specimen was examined and illustrated for the present study and is housed in the ZMUC.

Distribution. Known only from the Royal Botanic Gardens, Kew, where it was doubtlessly introduced.

Comments. Sissom (1980) reported only a single subapical spur on the basitarsus-tarsus of the pedipalp. There are actually two spurs, one located on each side of the segment near the base of the claw. The paralectotype female (ZMUC) differs from the redescription of this species only in minor abdominal setation numbers, size, and form of the metapeltidium. Tergites III-VII lack the lateral pair of setae and tergite IX has an additional dorsal pair of setae. The specimen, at 3.77 mm, is slightly larger in total length than the other specimens. The two plates of the metapeltidium are not separated anteriorly, but their borders are indicated by a light line.

We also wish to supplement the redescription as follows: Cheliceral setation: Type I = 3; type II = 5; type IV = 3 short setae plus 4 longer dorsal setae; type V = 8; type VI = 1. The cheliceral serrula has 12 teeth plus a larger, distal guard tooth; fixed finger with one medial tooth and smaller basal tooth.

The spermathecae and gonopod are similar to those of *S. tikaderi*, n.sp., and are here illustrated for the first time (Fig. 15). The gonopod is unusual for shizomids thus far illustrated in that it possesses a series of submedial granules. The ductules leading from the spermathecae are similar to those of *S. tikaderi* and many other *Schizomus* spp. (unpublished data).

Acknowledgments

We thank foremost Dr. B.S. Lamba, Joint Director-in-Charge, ZSI, Poona, for allowing one of us (DBB) to undertake field surveys in Maharashtra. Drs. Henrik Enghoff, Zoological Museum, Copenhagen; Norman I. Platnick, American Museum of Natural History, New York; and Gisela Rack, Zoologisches Institut und Zoologisches Museum, Hamburg, kindly loaned specimens in their care. Loans from the latter two institutions were arranged by Mr. James R. Reddell of the Texas Memorial Museum, Austin. We gratefully acknowledge this assistance and thank Mr. Reddell additionally for comments on the manuscript and for his many helpful discussions on schizomids. Dr. Gianna Arbocco, Museo Civico di Storia Naturale, Genova, kindly provided us with details on the lost type of *Schizomus cambridgei* (Thorell). Dr. Oscar F. Francke, Texas Tech University, also reviewed the manuscript.

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